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SUSTAINABLE PROCUREMENT FOR GREENER LOGISTICS IN THE HIGHER EDUCATION SECTOR

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Introduction

Higher Education Institutions (HEIs) are major centres of commerce and learning and in many municipalities, make up one of the largest regional employers. The 2013/14 academic year saw 2,299,355 students registered across 162 HEIs (1,759,915 undergraduates and 539,440 postgraduates) overseen by some 395,780 academic and non-academic staff (Higher Education Statistics Agency, 2015a). The total income generated across the sector was £30.7bn which would position it fourth in the FTSE 350 top revenues, ahead of Sainsbury's at £23.9bn (Association of University Directors of Estates, 2014). From this income, 44.5% is related to tuition fees, 16.5% research grants and contracts, 19.8% funding body grants, 18.1% other sources and 1.1% from endowment and investment income (Higher Education Statistics Agency, 2015b). In terms of the £29.4bn overall expenditure, £16.3bn (55.4%) related to staff costs with £11bn (37.3%) covering other operating expenses. By activity type, the functions of academic departments accounted for 38.7% of total expenditure (£11.4bn) with administration and central services taking 16% (£4.7bn), research grants and contracts 14.3% (£3.4bn), the maintenance of premises £3.4bn (11.6%) and academic services, residences and other expenditure making up £5.6bn (19.4%).

As a result, HEIs play a major role in the economies of the regions in which they sit (Wells et al., 2009) and directly contributed £17.9bn to the UK GDP in 2014 (Universities UK, 2014). This also suggested that for every 100 full-time jobs within a HEI, around 117 additional full-time equivalent positions were generated across other areas of the UK economy, equating to an additional £37.6bn in output being generated outside of UK HEIs as a direct result of their core activity.

Largely as a result of the more demanding student population since the introduction of tuition fees, investment in the HEI estate increased by 9% to over £2bn in 2013/14 including new build projects alongside refurbishment of existing infrastructure with 80% of HEI estate now classed as 'new' or 'good as new' (conditions A and B) compared to 63% in 2001/2002 (Association of University Directors of Estates, 2014). The servicing and upkeep of such facilities, along with the taught courses and research activities that utilise them, results in complex procurement, purchasing and supply chain processes (forwards and reverse) which can vary depending on the individual HEI structure and the level of autonomy afforded to individual departments. HEIs are becoming increasingly aware of the need to increase efficiency in these areas in order to maximise revenue whilst adhering to considerable legislation and standards, particularly related to procurement (e.g. Public Contracts Regulations 2015; BS8903) and waste management (e.g. Environmental Protection Act 1990; Duty of Care Regulations 1991; End-of-life vehicles directive 2003; Waste Electrical and Electronic Equipment (WEEE) Regulations 2005; Hazardous Waste Regulations 2009). In addition to this, other organisations such as People and Planet (2015) drive HEIs to improve their procurement and operating practices through the publicity generated by their league table of universities ranked by environmental and ethical performance.

Of interest in this paper is understanding the procurement and purchasing processes behind HEIs; how these impact on freight generation and vehicle arrivals at sites; and what approaches can be used to better visualise and quantify their impacts in order to recommend various mitigation strategies.

Higher education institutions – The procurement and logistics challenges

Administrative structures of UK universities have been found to vary considerably across institutions with no one model of best-practice operation standing out (Casu and Thanassoulis, 2006). The growth in undergraduate and postgraduate student numbers over the past 20 years, coupled to the management and procurement demands of diverse research environments, means that complex and fluid relationships often exist between centralised administrative staff and departmentalised academic managers and grant holders. Within each subject discipline, such centralised administrators are often seen as specialist having to have an in-depth knowledge of income routes, procurement channels and resource allocation processes (ibid).

Core university administrative functions can be deduced through the HESA Finance Record Coding Manual (Higher Education Statistics Agency, 2015c) and suggests that key areas of purchasing activity emanate from central services (including central university administration and services, general education, staff and student facilities, management of research grants and contracts, estates and facilities management, libraries, residences and catering operations) but also through individual departments. The latter can be very complicated when individual subject departments are sub-divided into research groups, each with multiple grant holders and secretarial staff ('requisitioners') who can purchase items on behalf of themselves and others to satisfy not only individual research projects but specialised taught programmes (often postgraduate). A study by Newcastle University (Zunder et al., 2014) suggested that 1058 requisitioners out of 5000 total staff existed across 144 schools/departments, all of whom could raise purchase orders. No link was found between the number of purchase orders and freight vehicle activity, with some orders corresponding to a single item delivered with other items in the same vehicle, while others were blanket orders covering several weeks' worth of deliveries to multiple sites. Often, suppliers operated a 'next-day' delivery service as a default due to a lack of clear delivery requirements on the purchase order and there was considerable difficulty linking goods receipts to purchase orders. The study concluded that it can be very difficult to use purchasing data to estimate freight activity on-site due to these issues.

With so many potential requisitioners across a university, there could be considerable inefficiencies at the individual department level with similar purchase orders being placed by neighbouring personnel which may or may not be being consolidated by the end supplier. The impact on freight activity can be further exacerbated by specific requisitioners holding purchasing cards (credit cards that allow goods and services to be purchased without the need to raise a purchase order). This can be used by budget holders to speed up the delivery of items that would otherwise take longer if going through the normal procurement channel. Staff having personal deliveries sent to their place of work can also create additional freight vehicle movements, the impacts of which are not well understood as most HEI green travel plans focus on staff travel and do not cover Delivery and Service Plans (DSPs) (Leonardi et al., 2014). With the recommendation from the Universities UK Efficiency and Modernisation Task Group (2011) that 30% of HEIs non-pay spend should be targeted through collaborative purchasing arrangements by 2016, following on from the sentiments in the McClelland Review (2006), there is a need to further investigate the link between procurement, purchasing and freight vehicle activity at HEIs.

Factors influencing procurement and logistics practices

There are several factors which are driving more sustainable procurement practices which could lead to more efficient logistics and supply chain management, although in many cases, the link is not explicit. Building on the sentiments from 'Procuring the Future', produced by the Sustainable Procurement Task Force (2006), BS 8903 (BIS Group, 2010) is now the British standard for sustainable procurement, defining this as, "only purchasing goods that are really needed, and buying items or services whose production, use and disposal both minimize negative impacts and encourage positive outcomes for the environment, economy and society." It sets out a framework for how HEIs could reduce their demand for resources and how to minimise any negative impacts from procuring goods, works or services across their life-cycle. It also shows how suppliers should meet minimum ethical, equality, human rights and employment standards; ensuring that fair contract terms and conditions are applied and how to encourage SMEs to tender. Loughborough University is one HEI that has realigned its procurement approach in accordance with the standard, particularly to help demonstrate its ability to monitor its Scope 3 emissions (those produced through an organisation's activities emanating from sources not owned or controlled by the organization), a requirement of the Higher Education Funding Council for England (BIS Group, 2012a).

The Public Contracts Regulations 2015 implement the new EU Public Sector Procurement Directive 2014/24/EU and apply to all new tender processes started on or after 26th February 2015. The regulations state that minimum numbers of tenderers must be sought by public sector bodies when issuing contracts for goods, works or services and that these must be adequately advertised. Of interest here are the criteria for award which are on the basis of the "most economically advantageous tender (MEAT)". Lowest price can no longer be a headline award criterion and issues like product quality, technical merit and running costs should also be considered. This could lead to other factors such as green logistics practices and supply chain being considered as part of the product/service delivery process. In addition to this, the Public Services (Social Value) Act 2012 amends Section 4 of the Local Government Act 2000 to give public bodies greater consideration as to the economic, social and environmental status of their locality when tendering through the use of local businesses where deemed appropriate (Chartered Institute of Procurement and Supply, 2013). This approach and switching to more local suppliers could also help to reduce supply chain mileage and logistics costs.

With the 2011 EU White Paper on transport's key goal of achieving CO_2-free city logistics by 2030 (European Union, 2011), there is an onus on local authorities to start rethinking the way business and residential districts are serviced and understanding the link between procurement and freight generation for large municipal organisations under their control is key to this going forward. Undertaking Delivery and Service Plans (DSPs) is one way HEIs can begin to understand this link (Leonardi et al., 2014; Browne et al., 2012; Cherrett et al., 2012). Servicing is a key activity causing freight vehicle activity and the ISO 14001 standard for environmental management systems is also enabling HEIs to better manage their waste and reverse logistics systems (Zhang et al., 2011).

Description of the problem and the research challenge

To become more sustainable and reduce the impacts of freight and service vehicle activity on-site, HEIs need to get a better understanding of the link between their procurement activities and freight vehicle generation. Using the Faculty of Engineering and the Environment at the University of Southampton as a case study, we considered the various aspects of purchasing and its impact on freight activity, including the purchasing methods used, the requisitioners and budget holders involved, types of goods being ordered by key suppliers and the resulting deliveries received.

Purchasing methods

The main purchasing methods in use at the University of Southampton are:

(i) Agresso – a financial management system by the Dutch company Unit4, comparable to the SAP system used at the University of Newcastle. This is used to raise purchase orders and manage invoices and payments. Agresso is directly linked to online purchasing catalogues for major suppliers such as RS Components, Office Depot, Onecall and Fisher Scientific.

(ii) Use of personal credit cards, cheques or cash – these are typically used for off-campus expenses associated with travel and subsistence rather than for purchases of goods or services that generate a delivery. The use of university addresses for personal deliveries is discouraged but is commonplace, according to anecdotal evidence from goods reception staff.

(iii) University credit card – members of staff may apply for a business credit card – normally only approved for those with recognised purchasing roles.

Orders can be placed using email or fax but normally require a formal purchase order to be attached or credit card details to be supplied. In some cases, suppliers may be willing to accept an order before a formal purchase order has been provided (e.g. university approved travel agents). Ordering by telephone is not permitted at the University of Southampton but is permitted at others (e.g. the University of Newcastle). Purchasing records for April 2015 from the Faculty of Engineering and the Environment indicated that 84% of purchasing expenditure was made through Agresso, 8% via expense claims (e.g. for travel to meetings, overnight stays etc.) and 3% by a university credit card, with 5% of purchasing relating to an invoice received with no corresponding purchase order assigned to it. In terms of numbers of purchases made, Agresso accounted for 41%; expense claims (40%); credit card (11%) and unknown purchasing methods (8%). The difference between the Agresso percentages (84% spend for 41% of purchases) was due to high value purchases (up to £144,000) being made through this route.

Data description

Detailed purchasing records from Agresso were obtained for the Faculty of Engineering and the Environment covering a period of one year, from 1st August 2013 to 31st July 2014 (comparable data for purchases made using a credit card or via an expense claim were not available at the time of analysis). These records included information on the type of good or service, the supplier, price, requisitioner, account being charged (e.g. code, budget holder, account type), faculty subdivision, delivery address and expected delivery date, with a system default of 'next day delivery' if not stated. Each record corresponded to a 'line item', i.e. an item purchased in a certain quantity (e.g. 12 boxes of paper). An individual order could include several of these with the dataset comprising 20,737 line items and 8,367 orders, giving an approximate ratio of 2.48 line items per order. The ratio of line items to orders can be used as an indicator of consolidation efficiency in that combining orders into fewer, larger ones will produce a higher ratio.

Requisitioners and budget holders

'Requisitioner' is defined here as the person who places the order on the financial management system while the 'budget holder' is the person responsible for the budget being used to pay for the goods or service and who has to formally approve the purchase. Neither of these are necessarily the 'user' – the person who actually wants the goods or service. Although across the University, approximately 4200 people have permission to make a requisition via Agresso, many prefer the simpler option of sending an 'internal purchase order' to a local administrator who then places the order on their behalf. Thus the local administrator would be identified in the data as the requisitioner, leaving the actual user unknown. These roles and the ordering process using Agresso are illustrated in Figure 1.

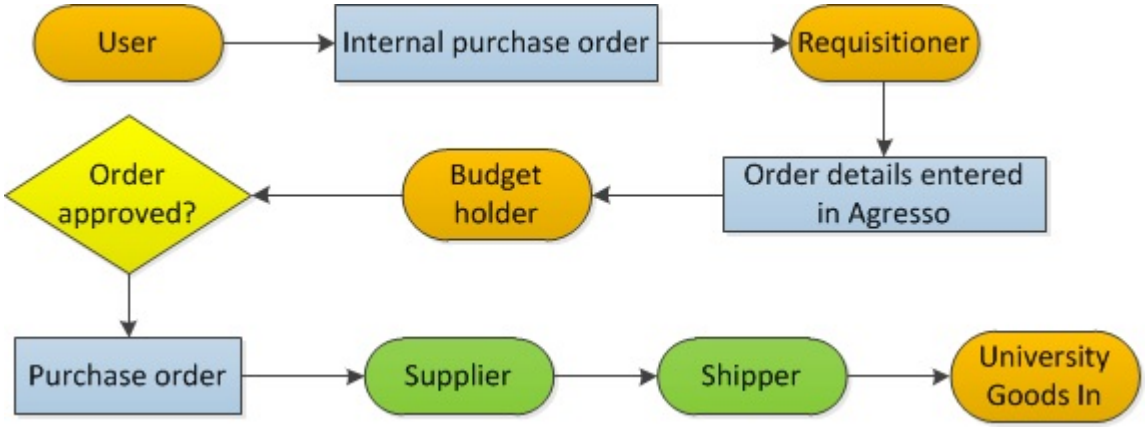

Figure 1 – Ordering process

Of the 247 different requisitioners found in the data, 85 (34%) placed relatively few orders over the year (10 line items or fewer) while only 9 (0.04%) ordered 500 line items or more with a similar pattern being observed for the 221 budget holders (Figure 2). The budget holders with the largest numbers of associated purchases were primarily senior administrators or academic staff in charge of several budgets. In the vast majority of cases (87% of line items) the requisitioner was a different person to the budget holder and on average, each requisitioner was associated with 5.4 different budget holders. The data suggested that 105 requisitioners were only associated with one budget holder, 16 of which were themselves; one requisitioner placed orders on behalf of 113 different budget holders.

With so many potential requisitioners across a university, there could be considerable inefficiencies at the individual department level with similar purchase orders being placed by neighbouring personnel which may or may not be being consolidated by the end supplier depending on the lines involved.

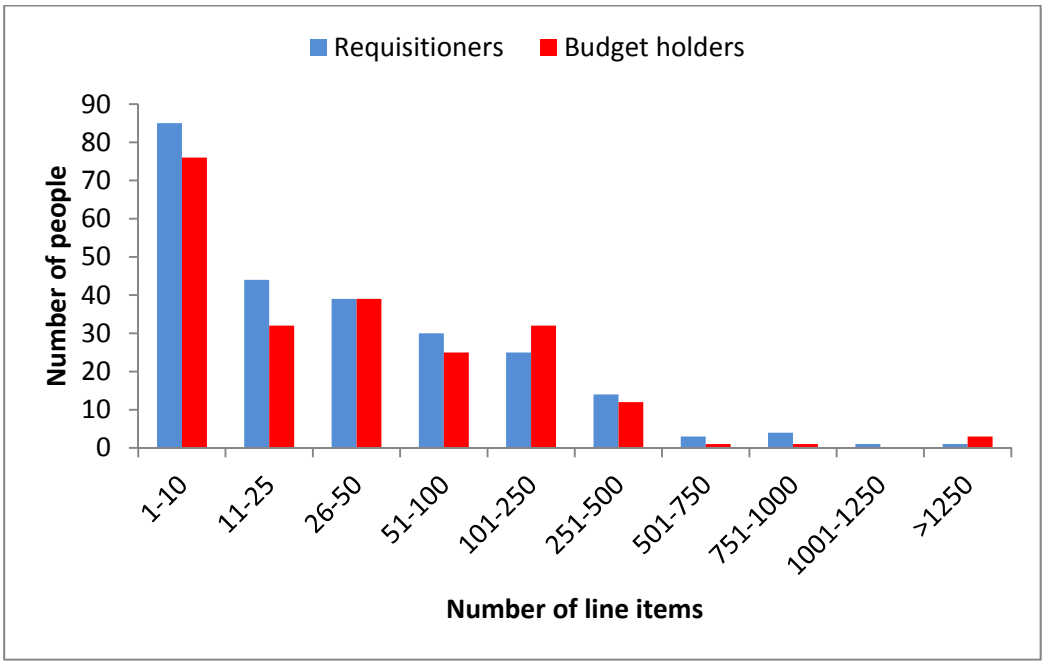

Figure 2 – Frequency plot of numbers of line items generated by requisitioners/budget holders

Product types and suppliers

Of the 258 defined product types identified in the data, the ones generating the most line items were: lab consumables (9.1%), electronic components (7.0%), office equipment (6.6%), electrical components (6.3%), fasteners (e.g. nuts and bolts) (5.4%) and small lab apparatus (5.1%). Cochlear implants also featured highly (4.7%) due to the auditory implant service operating within the faculty.

There were 987 different suppliers listed as providing products or services in the data (from a total of 13,817 suppliers registered on the university system). Suppliers of key products were identified to examine duplication and the potential scope for reducing numbers through improved coordination and reduction of deliveries. Although the university maintains an approved suppliers list covering most products and services, it remains relatively easy for budget holders to get new companies added and order goods at relatively short notice. A disincentive to going 'off-list' is the requirement to obtain two or more quotes from different suppliers in some circumstances, depending on the cost of the item/service.

Some product types did not appear to offer much scope for consolidation of suppliers as one company was used in the vast majority of cases. Examples were: i) office stationery and equipment, where one supplier was used for 89% of all purchases; ii) office furniture, where one supplier was used for 86% of all purchases; iii) outsourced catering (buffet lunches), where one supplier was used 92% of the time. A number of other external caterers were used but they provided distinct products, e.g. milk, water, coffee.

Cleaning equipment was provided by 8 different suppliers, with one accounting for 55% of purchases and the next largest, 13%. Batteries were supplied by three main suppliers (in proportions of 39%, 36% and 26%). Three component suppliers featured regularly throughout the data, namely Onecall, RS Components, and Office Depot.

Deliveries

At the time of the study, the Faculty of Engineering and the Environment was based solely on the university's main campus (Highfield). Although a single main goods reception point for the faculty was in use, some deliveries would go direct to other locations (e.g. catering, special equipment, gases, chemicals). A one-week survey (Monday to Friday, 07:00-16:00) of the main reception point, as part of a fourth year Civil Engineering Group Design Project (Bottomley et al., 2014), gave an insight into the freight vehicle activity associated with the faculty's purchasing habits.

- Between 17 and 23 freight vehicles visited the main reception point each day with a mean dwell time of 5 mins 26 secs and over the whole week, 95 vehicles were observed covering 21 separate logistics providers.
- Observed logistics providers ordered by number of visits during the week were: 8 (Royal Mail, TNT, DX, Yodel, Fedex); 6 (DPD, UKMail); 5 (Parcel Force, UPS, Citylink, Interlink, Hermes); 4 (DHL, APC); 2 (Tuffnels, Diamond Solutions); 1 (Acclaim, Wolsley, Clipper Logistics, Fisher Scientific UK, Meachers Global Logistics).
- On average, 215 items were delivered each day with the busiest period taking place between 09:00 and 10:00, 60% destined for the Faculty of Engineering and the Environment with the remainder (mainly Royal Mail) being moved through to other faculties.
- The total dwell time of freight vehicles on the Highfield campus was estimated to be 14 hours per week.

In a study of traffic movements at Newcastle University (Zunder et al., 2014), 600 vehicles were observed per day at four key locations around campus, 27% of which were freight vehicles, with 82% classified as 'light goods'.

Discussion: The scope for green logistics in Higher Education institutions

An initial investigation into purchasing behaviours across one faculty at the University of Southampton has shown that many requisitioners can act on behalf of academic and support staff, with some being major budget holders in their own right. There are clearly a few 'power' requisitioners within a faculty who place orders on behalf of many budget holders (one individual in this case covering 113 budget holders) with similar findings coming from Newcastle University. Campus freight surveys (Zunder et al., 2014; Bottomley et al., 2014) have indicated that considerable delivery and service vehicle activity occurs, with all the major carrier companies being active each day of the working week.

Having visibility of the goods and service requirements of multiple budget holders gives the power requisitioner the potential scope to consolidate orders of similar items. This depends on whether orders could be delayed and whether the true urgency of items can be determined from the budget holders. This is made all the more difficult when university credit cards can be used to effectively bypass the main purchasing system, the visibility of such transactions often not becoming apparent until after goods receipt. Reducing the numbers of suppliers may be beneficial from a logistics viewpoint but may limit consumer choice in a sector where the diverse nature of the research undertaken means that suppliers will always be diverse and numerous.

There are several ways in which purchasing practice can be made more effective with a view to reducing last-mile freight vehicle impacts at HEIs. 'Supply Chain Orchestrators' are management companies that oversee procurement and purchasing needs across different retailers by aggregating customer requirements and dispersing these amongst a group of suppliers. Such a technique could be applied to HEI departments within faculties to provide enhanced visibility of true purchasing needs and areas of commonality (ORACLE, 2008). Although specifically designed to reduce costs, they could be realigned to reduce last-mile impacts through consolidating supply chain activities. As part of its commitment to meeting the requirements of the BS8903 Sustainable Procurement standard, Marks & Spencer requires suppliers to meet its sustainability criteria, joining a 'supplier exchange' forum to share best practice. This concept can require suppliers to meet specific sustainable delivery criteria by stipulating minimum standards of practice that have to be demonstrated in the tender (BSI Group, 2012b).

Local collaborative supply chain networks can also be set up between HEIs and other related public bodies to achieve economies of scale in purchasing but also to address longer-term CO_2 reduction goals through collaborative logistics. The Southern Universities Purchasing Consortium (SUPC) http://supc.ac.uk/ and The South Coast Affinity Group (SCAG) http://www.southampton.ac.uk/susdev/procurement_and_waste/scag.html are both examples where sustainable logistics practices can be promoted both in the forward (SUPC) and reverse (SCAG) supply chains. These options, along with the scope for off-site freight consolidation, will be investigated as part of the three-year Horizon2020-funded CityLab project which started in May 2015, using the University of Southampton as a case study.

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